

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE

		110AFM01		
BITE VALVE ASSEMBLY, ITEM 110 ----- 0110-24777-07 (1)	2/1R	External water leakage.	END ITEM: Water leakage from bite valve or tubing	A. Design - IDB Bite Valve: The bite valve poppet and spring is designed to activate at a minimum vacuum force of 0.15 psid and provide a flow rate of 100 ml/scc at 1.25 + 0.1 psid vacuum. The silicone O-ring and diaphragm cover prevent contamination from entering the bite valve assembly. The bite valve is cleaned with alcohol to remove contamination and foreign matter. The outlet valve is inserted into the bladder and wrapped tightly 7-9 times with polyester thread to prevent the outlet valve from leaking at the interface. The thread is tied off with a surgical knot and then coated with urethane adhesive to cover knot and secure ends. The IDB is worn inside the HUT which protects the valve from damage.
DISPOSABLE IDB TUBING SUBASSEMBLY ITEM 110 ----- 0110-812729-01 (1)		IDB Bite Valve: Contamination or foreign matter in valve. Broken/defective O-ring or spring. Hole in diaphragm, defective thread. Damaged cover.	GFE INTERFACE: Depletion of potable water and water flowing into vent system.	DIDB Tubing Subassembly: The disposable IDB Tubing subassembly is a 3-part assembly consisting of a silicone bite valve, a polyurethane drink tube, a nylon barb inserted into a polyolefin elbow port which is heat sealed into the bladder film interface to preclude leakage and prevent contamination. The drink tube has a 60 degree bend heat set into the tube to position the bite valve close to the crewmember's mouth. All interfaces of the Tubing subassembly are friction fit. The DIDB is contained within a reusable fabric restraint that is attached to the front wall of the HUT and protects the bladder assembly from damage.
		DIDB Tubing Subassembly: Damaged or defective valve. Contamination or foreign matter in valve. Inadequate connection between bite valve, polyurethane tube barb on elbow port.	MISSION: Terminate EVA.	B. Test - Acceptance: Component - See Inspection.
			CREW/VEHICLE: None with single failure. Loss of crewmember with loss of SOP.	PDA: The following tests are conducted at the IDB/DIDB Assembly level in accordance with ILC Document 0111-70028J (IDB) or 0111-710112(DIDB): IDB: 1. Proof pressure leakage tested in restraining fixture to 2.0 (+0.1 - 0.0) psig. 2. Leak tested to verify no leakage through valve and hose assemblies.
			TIME TO EFFECT /ACTIONS: Seconds. The fan may be shut off in the event that an extreme leak is detected to prevent water from entering vent return duct. After the fan has been shut off, activate purge valve and return to airlock.	DIDB: 1. Proof pressure/leakage tested to 2.2 psid. 2. Visual inspection to verify no leakage through valve or bladder.
			TIME AVAILABLE: Minutes.	Certification: IDB: The IDB was successfully tested (manned) during SSA certification to duplicate six year operational usage (Ref. Cert Test Report for the SSA, ILC Document 0111-70027). The assembly was successfully tested to the S/AD ultimate pressure of 2.7 +/- 0.1 psid for 5 minutes with the IDB restrained to a maximum thickness of one inch. DIDB: The DIDB was successfully tested (manned) during certification to duplicate a single usage (with safety factor). The DIDB assembly successfully passed S/AD Requirements including 64 actuations of the valve assembly to ensure proper operation.
				C. Inspection - IDB/DIDB: Components and material manufactured to ILC requirements at an approved supplier are documented from procurement through shipping by the supplier. ILC incoming

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		110AFM01		
			TIME REQUIRED: Seconds.	receiving inspection verifies that the materials received are as identified in the procurement documents, that no damage has occurred during shipment and that supplier certifications have been received which provide traceability information.
			REDUNDANCY SCREENS: A-PASS B-PASS C-PASS	The following MIPs are performed during the IDB manufacturing process to assure that the failure causes are precluded from the fabricated item: Verify cleanliness to VC level. Verify threads are securely wrapped, tied and coated (IDB).
				PDA: The following MIPs are performed at the IDB assembly level per ILC Document 0111-70028, and at the DIDB assembly level per ILC Document 0111-710112: Visual inspection for material degradation and cleanliness to VC level. Verification of successful completion of leakage test.
				D. Failure History - IDB: I-EMU-110-001 (02/22/82). Drink Valve leaked. Revised concentricity of valve seat. B-EMU-110-A002 (02/02/87). Drink valve leaked. Extreme care to be employed during handling of screened vent port. B-EMU-110-A004 (1/18/89). IDB BITE valve assembly poppet stuck open, allowing water to leak out and then sealed properly in further tests. A particle lodged in the poppet seat prior to first test, and then dislodging prior to additional tests, enabling proper poppet seating. No corrective action taken. B-EMU-110-A005 (7/31/89). The IDB Bite Valve leaked due to a piece of EVA (Ethylene Vinyl Acetate) contaminant lodged under the poppet. The contamination is from the EVA tubing fill lines at Boeing since no EVA is used in the IDB. To preclude this failure from recurring, Boeing is implementing a particulate filter into the IDB fill tool per ECM#905160.
				B-EMU-110-A008 (9/10/91) - A visual inspection of the IDB revealed two black fibers and an elastomeric particle from an improperly punched drink tube hole. Per RDR B-EMU-110-A009, a 15 micron filter will be incorporated into the fill tool to preclude foreign particles like the black fibers from entering the IDB. ECO 922-0085 changes the manufacturing procedures to include a 10X inspection of the drink tube holes to verify they are smooth and clean of particles.
				B-EMU-110-A009 (10/29/91) - The IDB outlet valve exhibited excessive leakage which could not be duplicated at ILC. The leakage could have been caused by particulate contamination lodged in the poppet area which subsequently dislodged and returned the outlet valve to normal operation. BAO has incorporated a 15 micron filter in the IDB fill tools to preclude future contamination. In addition, a flushing procedure and visual inspection has been added to IDB flight processing.
				I-EMU-110-A005 (4/30/92) and B-EMU-110-A011 (11/12/92) - IDB bite valve screens debonded due to lack of Hysol adhesive. The bite valve cover/screen was changed to a one piece perforated cover, eliminating the bonded screen.
				J-EMU-110-F001 (02/09/95) - External water leakage from bite valve due to corrosion between the valve poppet and housing causing poppet to stick open.

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		110AFM01		<p>Cause was residual water after current drying procedures. Revised IDB drying procedure to add 2 hours drying time beyond point when the bag is visibly dry. Also imposed 4 year bite valve internal part inspection.</p> <p>B-EMU-110-A012 (3/23/95) - IDB Bite Valve leakage was being caused by a tolerance stackup condition in the poppet/diaphragm area. The current design cover can cause leakage by depressing the diaphragm and poppet under certain tolerance stackups. A new vent cover design with a counterbore to provide additional clearance was implemented.</p> <p>I-EMU-110-A007 (10/13/97) - During PDA leak testing, continuous flow of bubbles noted from bite valve. Investigation revealed field replacement poppet spring had not been stretched prior to installation to provide adequate poppet sealing force. Requirement for spring adjustment was unknown and, therefore, not performed in field. Maintenance Manual and Bite Valve drawing revised to state that spring is a match fit and can only be removed/replaced at Airlock.</p> <p>DIDB:</p> <p>I-EMU-110-C002 (12/10/99) - leakage between drink tube and valve caused subject to draw air from drink bag instead of water during DIDB testing. Piggy backed to I-EMU-110-C004.</p> <p>I-EMU-110-C003 (12/11/99) - leakage between drink tube and valve caused subject to draw air from drink bag instead of water during DIDB testing. Piggy backed to I-EMU-110-C004.</p> <p>I-EMU-110-C004 (12/14/99) - leakage between drink tube and valve caused subject to draw air from drink bag instead of water during DIDB testing. Root cause determined to be debris and dimensional outages caused by extraction of steel core mold that forms internal cavity from the valve housing. Also, the valve design is susceptible to side loading which can dislodge the drink tube at the barb retention shoulder. Revised manufacturing procedures to minimize housing damage during core removal. Added 100% dimensional inspection on all machined dimensions. Adde drink tube strain relief.</p> <p>B-EMU-110-F003 (4/21/01) - While on STS-100 EVA, crewmember reported eye irritation precipitated by inadvertent DIDB water release. Root cause determined to be inadvertent actuation of bite valve in conjunction with pressure applied to DIDB bladder. DIDB drink tube assembly to be redesigned with dome valve incorporated to minimize leakage from bite valve. (ref CCBDH7170)</p> <p>E. Ground Turnaround - During ground turnaround, in accordance with FEMU-R-001, the IDB is subjected to valve functional testing, structural and leakage tests, and visual inspection for material damage or degradation.</p> <p>The DIDB is not subjected to ground turnaround since it is a disposable item.</p> <p>F. Operational Use - Operation Use - IDB/DIDB: Crew Response -</p>

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		110AFM01		Pre/post-EVA : Troubleshoot problem, if no success, replace IDB/DIDB. If no replacement, EMU no-go for EVA. EVA : If significant amounts of water detected, deactivate fan, open purge valve, terminate EVA. Special Training - Standard training covers this failure mode. Operational Considerations - Flight rule A15.1.2-2 of "Space Shuttle Operational Flight Rules", NSTS-12820 defines go/no go criteria related to EMU ventilation flow. Generic EVA Checklist, JSC-48023, procedures Section 3 (EMU Checkout) and 4 (EVA prep) verify hardware integrity and systems operational status prior to EVA. Real Time Data System allows ground monitoring of EMU systems.

EXTRAVEHICULAR MOBILITY UNIT
SYSTEMS SAFETY REVIEW PANEL REVIEW
FOR THE
I-106 GLOVE ASSEMBLY
CRITICAL ITEM LIST (CIL)

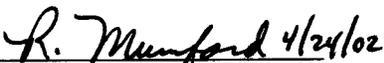
EMU CONTRACT NO. NAS 9-97150

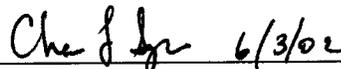
Prepared by: 
HS - Project Engineering

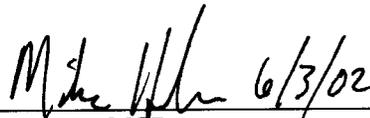
Approved by:  22mar02
NASA - SSA/SSM

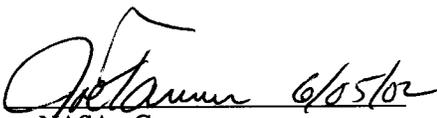

HS - Reliability

 5/23/02
NASA - EMU/SSM

 4/24/02
HS - Engineering Manager

 6/3/02
NASA - S & MA

 6/3/02
NASA - MOD

 6/5/02
NASA - Crew

 6/3/02
NASA - Program Manager